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ABSTRACT

Major findings of the 1974-1977 Massachusetts statewide educational assessment are summarized and some readily available and useful instructional resources are identified. The findings are designed to assist teachers and administrators in discussion. Each section begins with a commentary and is followed by a review of findings, a discussion of curriculum observations and their relationship to the findings, and suggestions for curriculum materials. The eight sections are: occupational knowledge and attitudes, consumer skills and values, school climate, mathematics, reading, social studies, writing, and science and ecology. (Author/CTM)

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RESOURCES FOR SCHOOLS

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MASSACHUSETTS
DEPARTMENT
OF EDUCATION

8. A REVIEW OF MASSACHUSETTS STATEWIDE ASSESSMENT FINDINGS: A CURRICULUM INTERPRETATION OF THE MAJOR FINDINGS OF THE MASSACHUSETTS STATEWIDE ASSESSMENT PROGRAM

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8. A REVIEW OF MASSACHUSETTS STATEWIDE ASSESSMENT FINDINGS: A CURRICULUM INTERPRETATION OF THE MAJOR FINDINGS OF THE MASSACHUSETTS STATEWIDE ASSESSMENT PROGRAM

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PREFACE

Resources for Schools is a series of publications developed by the Massachusetts Dissemination Project (MDP) for Massachusetts educators, parents, and students. The project, funded by the National Institute of Education, has four major goals:

- to stimulate greater awareness of the resources available to Massachusetts schools,
- to provide educators, parents and students with specific information about resources and materials for school programs and services,
- to assist regional education centers and the Department to increase and improve information and dissemination services to educators, parents, and students in the state,
- to encourage greater exchange and sharing of resources among educational organizations, service providers, the Department of Education and its regional education centers, and school personnel.

The project is located in the Department's Boston office. In addition, each regional center has designated a staff member who maintains continuous contact and involvement with project activities across the state, and is responsible for working with center staff to improve information and dissemination services in the center. Ultimately, the regional centers will function as switchboards -- sometimes providing services directly to schools, other times connecting them with the many existing resources. The development of this series -- as its name suggests -- is one way the project is helping make these connections. *Please contact a member of the project staff for more information about the series, the project or the regional center nearest you.*

Resources for Schools presently available:

1. A Catalog of Publications from the Massachusetts Department of Education
2. Video Tapes for Teaching
3. A Guide to Dissemination Agencies
4. Community Involvement in Your School: A Guide to People, Programs and Publications
5. The Student's Guide to Special Education
6. Implementing Chapter 622: Exemplary Programs for Alleviating Racism and Sexism in Massachusetts Schools
7. Competency Programs for Basic Skills Improvement: A Resource Guide

Resources for Schools topics to look for in the future:

. Special Education Teacher Training Resources
. Student Rights and Responsibilities

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INTRODUCTION

This publication summarizes the major findings of the Massachusetts statewide educational assessment and identifies some readily available instructional resources that can be brought to bear in the areas noted in the findings.

The assessment provides information on the performance of a random sampling of nine and seventeen year old students in major subject areas. It also provides information about consumer skills and knowledge and, for the older group, occupational and career attitudes and knowledge. Begun in Massachusetts in 1974, the assessment program is a continuing series of annual evaluations of the knowledge, understanding, skills, and attitudes of public school students. The tests do not compare students; rather the tests are designed to measure what students know and can do in a selected subject area. The tests are known as objective referenced tests and the results are reported in terms of the percentage of correct and incorrect responses.

Like the National Assessment of Educational Progress (NAEP), started in 1969, the Massachusetts assessment attempts to take stock of the progress of education by revealing the levels of attainment in basic curriculum areas of public school students in different age groups. This is the essential purpose of the assessments. But this information alone is not necessarily directly useful to the schools. Even the barest descriptive analysis indicates deficient levels of attainment in some areas. But then what? Are there instructional materials that might help to eradicate some of the cavities of ignorance in the classroom? A host of factors play a role; but the curriculum is a basic component in raising the level of attainment.

Many states have adopted assessment programs modelled to a great extent on the NAEP: but Massachusetts is the first state, as far as I know,

to relate the census-like data to explicit instructional material options.

This report is addressed to teachers and administrators to use as a discussion memorandum rather than as a prescriptive document. It is not a blueprint for change. Nor is it an endorsement of any instructional materials cited. Undoubtedly, there are more good programs available than are noted in this report. The instructional materials lists are not comprehensive; but they do suggest the qualities and diversities by which additional resources can be assessed. Leading publishers have materials to respond to different ability groupings (i.e. the very able student as well as the slower learner) although the listings of materials are not separated by ability grouping in this report. All materials noted are the most recent issues or revised editions. Complete addresses of all publishers and suppliers are given at the end of the report.

Each section begins with a commentary and is followed by a review of findings. A discussion of curriculum observations and their relationship to the findings comes next. Suggestions for curriculum materials come last.

A strong and healthy skepticism is desirable in reading this report. It is a first approximation, after all, and it does not reflect the dynamics and idiosyncracies of individual schools. Teachers and administrators must reflect these suggestions through their knowledge and experience.

I

HIGHLIGHTS OF THE STATEWIDE ASSESSMENT

1974 - 1977

- Nine year olds do extremely well in reading, mathematics and science compared to their national counterparts. Seventeen year olds do as well as or better than their national counterparts in reading, mathematics and social studies and less well in writing and science.

- Seventeen year olds are generally very distrustful of political leaders. Sixty-nine percent feel that "quite a few" political leaders are a "little bit crooked". And 44 percent feel that the government in Washington can be "trusted some of the time".

- Girls in both age groups perform poorer than boys in science, mathematics and social studies. They perform better than boys in reading and writing. The effects of sex-role stereotyping appear in the early elementary grades.

- Roughly 56 percent of the seventeen year olds have never had a science course with laboratory experiences.

- Much lack of knowledge about our political and economic systems exists among nine and seventeen year olds. More than a third of seventeen year olds have little or no idea of the fundamental differences between the United States and the USSR.

- A significant portion (roughly 25 percent overall) of the seventeen year olds appears to lack the knowledge and skill to solve relatively simple, everyday consumer problems. Only 39 percent correctly figured out a 6 percent sales tax on a $60 bicycle. Slightly more than 50 percent were able to fill out a job application form correctly.

- Possibly as important as any of the assessment findings is this: most seventeen year olds report that school is "too easy". They feel they are not being challenged much.

- Positive ratings of school climate by students, teachers and administrators appear, by and large, to be independent of the kind of community in which the school is located.

- Less than half of the seventeen year olds are able to identify the kinds of academic programs and courses leading to specific jobs or careers. Career counsellors do make a difference. Students who discuss things with them are much better informed about career options than those who do not have these discussions.

- The least important goal in life of the seventeen year olds is to become a community leader. Their most important goal is to have a "good marriage and a happy family life". They may appear to be not especially acquisitive or ambitious; but it is not fair to assume that they are turned off. Simply, they do not seem to share the "work or starve" syndrome of many of their elders.

- With the exception of social studies, the performance of Massachusetts nine year olds either exceeds or is as high as that of their peers throughout the United States.

- Building principals can be the difference between an achieving school and a failing school. What he or she values most -- an emphasis on reading, for example -- often shows up in classroom results and academic achievement. This is the case for both elementary and high schools.

- Generally, seventeen year olds who work after school and on weekends perform better in all subjects.

- There is no evidence in the assessment to link television advertising to poor consumer habits. Both nine and seventeen year olds are very skeptical about television advertising. Ninety percent of the nine year olds and 95 percent of the seventeen year olds believe this statement to be false: "Advertising on TV could never be wrong".

II

OCCUPATIONAL KNOWLEDGE AND ATTITUDES

COMMENTARY

Gerard Piel, publisher of Scientific American, wrote an article in the January 1978 issue of Educational Researcher in which he said, "It is the mission of our schools not to shape the citizen to the uses of society, but to nurture citizens capable of shaping society to better purposes". Hardly a month goes by without national media stories and editorials on how inadequately schools prepare students for employment and careers. The focus of many of these stories is not on creating superior educational opportunities so that young people might raise their career expectations, aptitudes and motivation; the focus is on training students to have certain minimal capacities to survive in minimal jobs in factories, on production lines, in typing pools, and the like.

One of the goals of education should not be to prepare, or to dump, young adults, with little knowledge and few skills, into lifelong semi-skilled jobs. Although they may spend their lives in second class, economic citizenship, the intellectual vacuities of many such jobs should not be the aim or the result of spending twelve years in formal education.

If our schools actually expect to nurture citizens capable of shaping society to better purposes, as Piel claims, then a readjustment of community values is the essential first step. Most schools reflect community values; they reflect and represent the underlying systems of belief. If parents have low expectations for their children, can schools be expected to eradicate them and substitute high expectations to create a heightened sense of career possibilities? Schools just can't do everything.

Nevertheless, the findings of this part of the Massachusetts assessment may be as important as any of the findings in the subject areas for

they illuminate the enormity of the job facing everyone who hopes to give all public school students a better chance.

FINDINGS

Occupational Knowledge and Attitudes - Sex Differences

Many of the important professions and vocations are preferred equally by boys and girls. In equal numbers, girls would like to become architects, lawyers, doctors, reporters and photographers. The customary sex-role stereotypes seem to be non existent in the choice of professional and semi-professional fields.

The customary sex-role stereotypes, however, appear among the groups that aspire to skilled, semi-skilled and unskilled jobs. Girls want to be typists, social workers, travel agents, dance instructors and fashion designers. Boys want to be firefighters, carpenters, truck drivers and plumbers.

Job Knowledge

Career counsellors do make a difference. Students who report they discuss things with career counsellors are much more informed about career options and they plan better on how to begin reaching their objectives. In short, counsellors provide a real service. The students with whom they come in contact know a lot more about careers and occupations than do the students whom they seldom or never meet.

Only 48 percent of the seventeen year olds are able to select the high school courses as well as the post-secondary education and training most appropriate, if not necessary, for certain kinds of jobs and professions.

Roughly one out of three students has little or no understanding of different job classifications and professions. This proportion doesn't know the difference between an architect and a draftsman, an ariplane mechanic and a mechanical engineer.

Work Attitudes

Girls want to enter the professions less for the monetary rewards than to have opportunities to serve the public. Twenty-two percent of girls compared to eleven percent of boys feel it's much more important "to help solve social problems". More boys than girls report that their significant goals are to have "plenty of money" and "steady work and a stable income."

Many critics note the changing attitudes of young adults to work and employment; work, it is claimed, is subordinate to other interests and pursuits. Two-thirds of the students report that their most important job factor is that their work be "interesting". Less than 50 percent considered the opportunity for promotion and advancement. Only 12 percent report that they are able to put up with boring jobs.

Many vocational students seem to be followers, accepting authority without ever questioning it; and settling for less. Fifty-four percent of vocational students compared to 31 percent of college bound students report that it is important not "to stir things up" and "to keep their mouths shut" if they want to become successful. Seventy-five percent of vocational students compared to 63 percent of college bound students strongly feel that it's important "not to get into things that are over their heads". They won't take many risks.

Occupational Knowledge - Background

The correlation between career expectations and social and economic backgrounds is clear. The job and career expectations of the seventeen year olds are as generally stratified as their backgrounds. Students in residential suburbs are more knowledgeable about, and have higher aspirations for, both careers and occupations than students in other kinds of communities. Students in large cities have the lowest expectations and the least knowledge about career and occupations.

Life Goals

Depending on one's frame of reference, the seventeen year olds display a solid sense of values. The major goal among the majority of girls and boys is to have "a good marriage and a happy family life". Following are: "being successful in my work" and "having good friends." Their least important goal is "to become a community leader".

CURRICULUM OBSERVATIONS

A number of cultural pressures and attitudes affect the occupational and career goals of students; and schools cannot address or resolve all of the problems. They influence--sometimes to a great extent--students' awareness of the opportunities for personal and professional growth. Sensitive schools and responsive teachers notably, may affect the achievement motivation of students in any school-community setting; and at times schools can help to overcome debilitating socio-economic backgrounds.

Ideally, the time to start making significant inroads on student awareness is during the elementary school years. Attitudes of teachers and administrators can have an overriding influence. Rich and rigorous curricula that cover the fundamentals while they simultaneously describe possibilities in later life; schools working with communities--these aspects of learning, and many more, do influence the direction of the lives of children and help to generate career aspirations. Possibly, by the time a student is in the junior year of high school, the mold is already set; the opportunities to create heightened vistas and career goals are limited.

Some publishers are promoting, and school systems devising, what they call "career-related mathematics", K-12. It is claimed by the developers that these programs relate the academic curriculum to "real world career opportunities". It is debatable whether these programs benefit students as

much as traditional mathematics programs, many of which do contain "real world mathematics".

It has been suggested that special courses be given in occupational knowledge; but many educators resist this notion. Some systems are developing interdisciplinary approaches for high school students. For example, English and occupational education departments work together to present career-oriented activities. There is a growing movement to link schools to industry, especially in trying to match the interests of graduates to the needs of industry. Work-study programs for high school students are receiving increasing attention.

There are many agencies and instructional materials that deal with sex-role stereotyping; and major publishers appear to have made much progress in developing bias-free curricula.

CURRICULUM MATERIALS

1. A number of resources are available to assist in addressing the problems of sexist stereotyping and in enlarging career possibilities for young girls and women. Some are:

Womens' Educational Equity Communications Network
Far West Laboratory
1855 Folsom Street
San Francisco, California 94103

(This group provides information and materials on curricula and teacher training.)

- - - - - - - - - - -

Project on The Status and Education of Women
Association of American Colleges
1818 R Street, NW
Washington, D.C. 20009

(This group is a clearinghouse of information and materials for schools as well as colleges.)

- - - - - - - - - - -

Resource Center on Sex Roles in Education
National Foundation for the Improvement of Education
1156 15th Street, NW
Washington, D.C. 20005

- - - - - - - - - - -

Project on Work in Technology and Science
Room 200-228
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

(This project sponsors programs for junior high and secondary teachers and counsellors to encourage women to consider careers in science and engineering.)

- - - - - - - - - - -

Engineers' Council for Professional Development
345 East 47th Street
New York, New York 10017

(Provides information on career opportunities for women in seventeen different fields of engineering.)

- - - - - - - - - - -

The following books and reports are available:

Issues of Sex Bias and Sex Fairness in Career Interest Measurement

E. Diamond, Editor
Career Education Program
Department of Health, Education and Welfare
Washington, D.C. 20208

Report on Sex Bias in the Public Schools

National Organization of Women
28 East 56th Street
New York, New York 10022

The Process of Change: A Handbook for Teachers on the Concept of Changing Sex Role Stereotypes

Far West Laboratory
1855 Folsom Street
San Francisco, California 94103

2. The following organizations provide assistance in occupational education:

Triple E Resource Center
Education Collaborative of
Greater Boston (EdCo)
20 Kent Street
Brookline, MA 02146

Skills Bank Network
Northeast Regional Education Center
1551 Osgood Street
North Andover, MA 01845

Experienced-Based Career Education
Research for Better Schools
1700 Market Street
Philadelphia, PA 19103

The Tri-Lateral Council
125 High Street
Boston, MA 02110

Massachusetts Occupational Information System
60 William Street
Wellesley Hills, MA 02181

The Education Cooperative
c/o Memorial School
Eliot Street
South Natick, MA 01760

Massachusetts Diffusion Assistance Project
290 South Main Street
Andover, MA 01810

3. The Division of Occupational Education, Massachusetts Department of Education, publishes a quarterly newsletter about programs, reports, and conferences, for individuals involved with career guidance.

Careergram
Career Guidance Specialist
Division of Occupational Education
Department of Education
31 St. James Avenue
Boston, MA 02116

4. The roadblocks to achieving more equitable career aspirations for young girls and young women are enormous. Expert assistance is essential. Everyone charged with educational responsibilities can help to remove some of the roadblocks. In the elementary grades, the curriculum does play a role, if not a significant one, in encouraging girls to aspire to careers in science. Previous research in Massachusetts* indicates that girls have attitudes toward science as positive as those of boys when instructional materials that encourage individual experimentation are used. Some of these programs are noted in the science section of this report; three programs are noted here:

Elementary Science Study, published by these companies: McGraw Hill, American Science & Engineering, and Selective Educational Equipment

Science Curriculum Improvement Study, published by Rand McNally, Selective Educational Equipment and American Science & Engineering

Science: A Process Approach, published by Xerox

* Something of Value, Dean K. Whitle and Dan C. Pinck, Office of Instructional Research and Evaluation, Harvard University, 1973.

By encouraging classroom discussions about sex-role stereotypes in science and by offering programs that allow individual experimentation, teachers can help to offset the traditional view questioning the ability of girls to do science, as well as the propriety of their being scientists. And, in the later school years, counselling can be especially important in advising girls that three years of mathematics, for example, are needed in the secondary years.

5. The Department of Education's Student Service Centers, a student-initiated project, provide a variety of services, including a newsletter and topic files on issues relating to careers and occupational education.

Bureau of Student Services
Massachusetts Department of Education
31 St. James Avenue
Boston, MA 02116

III

CONSUMER SKILLS AND VALUES

COMMENTARY

Perhaps it is asking too much to encourage young persons to be more discriminating -- to be less susceptible to advertising -- when adults are not. Almost everyone is assaulted daily by urgent, anxious messages in the media to buy, buy, buy. Instant gratification is the order of the day. Yearly and seasonal changeovers in cars, clothes, hi-fis, and a myriad of other things help to create an acquisitive society. Marketing and advertising are relentless allies, often skirting the edge of truth. Even attempts at self-policing by business fail to limit the number of meretricious statements and do not dispell the disingenuous logic behind them. Even when the federal government demands a small-type notation on the label implying that a product may injure one's health, there is still a great army of buyers, among young and old.

Today, many students can afford to buy cars as well as other expensive things on credit. This part of the Massachusetts assessment suggests that the majority of students are highly skeptical about advertising claims; but, nevertheless, they seem to be trapped, as we all are, in the race to acquire things, perhaps regardless of value and need.

Students in both age groups, the nine year olds and the seventeen year olds, indicate that they possess a certain sense of discrimination and that they have a fair knowledge of what's good for them. However, their consumer values may exceed their consumer skills; and what may be the principle lack is an adequate knowledge of the simple arithmetic required to find out exactly how much they ought to be charged for particular items. In this

sense, in particular, mathematics becomes a critical skill. But it should be accompanied by highly developed critical thinking.

What role do schools have? Can schools teach critical thinking to the extent that most students can analyze all advertising statements and can separate inferences and assumptions from facts? Can schools repair whatever deficiencies exist in the area of consumer skills and values? The larger problem is where should consumer education fit into the school curriculum? Since there's little evidence of higher performance by students in schools that offer consumer education programs, perhaps a greater concentration of effort should be made in the basic subjects.

FINDINGS

Consumer Knowledge - Television

It is difficult, if not impossible, to obtain accurate conclusions about television's role in consumer knowledge; but most critics believe that television does extend the range of what's wanted and of what's bought. There is no evidence in the assessment that definitely links television advertising to poor consumer practices. The connection may be there; but the assessment doesn't uncover it. Both age groups are far from gullible. Ninety percent of the nine year olds and 95 percent of the seventeen year olds know this statement is false: "Advertising on television could never be wrong."

However, and even more importantly, the assessment found consistent correlations between the time spent watching television news (and other programs) and student performance in all of the consumer education content areas. Students who spent the most time watching television news performed better on the test of consumer skills and values. Students who were more attracted by advertisements and comics in the newspapers did less well than students who

were more interested in new stories.

Consumer Knowledge - The Basics

Consumer awareness or sophistication is greatly dependent on basic skills in mathematics, English and history. It stands to reason that any student who doesn't know how to figure percentages; how to read a graph; how to multiply, divide, add and subtract; how to comprehend what he or she has read--is likely to become a poor consumer.

Use of simple mathematics was required in two questions asked of the seventeen year olds:

- "You were given a 10% discount on a $50.00 bicycle, how much did you pay for the bicycle?"

  (Only 66 percent knew the correct answer.)

- "You go into the store to buy a $60.00 radio and the sales tax is 6%. What is the total cost of the radio?"

  (Only 39 percent knew the correct answer.)

A limited vocabulary affects one's consumerism: 37 percent of the seventeen year olds did not know the meaning of loophole; and 43 percent did not know the meaning of embargo. Twenty-five percent of the seventeen year olds did not know that the Internal Revenue Service collects taxes.

Can high school students buy a car without being gypped? Or are they going to be fleeced? Sixty-three percent report that a private finance company is the most expensive place from which to borrow money. But 37 percent report the most expensive place is the local bank -- or the federal government.

Consumer Knowledge - Sex Differences

Generally, there's an insignificant difference between girls' and

boys' scores in consumer knowledge and skills. However, in planning and budgeting, girls are far more aware and adept (roughly a twenty point difference separates them). Girls are better able to plan for effective decision making and are generally more accurate in their practical work and more insightful in their conceptual thinking.

Consumer Knowledge - Background

Students in higher income families display a better knowledge of consumerism than do students in families with moderate and low incomes. This merely confirms that students in higher income families have more opportunities to become familiar with consumer activities.

CURRICULUM OBSERVATIONS

It is debatable whether separate courses in consumerism should be advocated. Supplementary materials are available that can be taught along with other subjects. And, in mathematics and social studies, materials exist that impart considerable knowledge and information about consumerism. In addition, many biology programs contain much information about good habits in nutrition.

Since the school curriculum is already so fractionated, perhaps the more educationally sound policy would be to integrate the teaching of consumer skills into the teaching of the basic subjects. For example, if 61 percent of the seventeen year olds do not know how to compute a sales tax on an item to determine its total cost, then the way to correct this lies not in a course in consumerism or consumer math, but rather in using mathematics materials in basic courses which teach such simple operations.

CURRICULUM MATERIALS

Instructional Materials Suggestions

1. These mathematics programs provide the necessary insights and skills to be able to do "consumer math" problems. The exercises and analogies in them cover a range of consumer problems and situations. These materials have been selected from the list of materials in the mathematics section of this report.

K - 8

Mathematics Around Us
Scott, Foresman and Company

Growth in Mathematics
Harcourt Brace Jovanovich

Mathematics for Mastery
Silver Burdett Company

Laidlaw Mathematics
Laidlaw Brothers

Holt School Mathematics
Holt, Rinehart and Winston

Mathematics
Houghton Mifflin Company

Real Math
Open Court Publishing Co.

Investigating School Mathematics
Addison Wesley

Individualized Math System
Ginn and Company

Field Mathematics Program
Prentice-Hall

Junior High

Modern School Mathematics
Houghton Mifflin Company

Holt School Mathematics
Holt, Rinehart and Winston

Mathematics for Mastery
Silver Burdett Company

Mathematics
Addison Wesley

High School
(essentially remedial programs)

Individualized Computational Skills Program
Houghton Mifflin Company

Applications in Mathematics
Scott, Foresman and Company

Consumer Mathematics
Silver Burdett

Economics for Young Adults
Sadlier/Oxford

Arithmetic: Without Trumpets or Drums
Allyn and Bacon

2. The following publications illustrate the kinds of resources available from ERIC Document Reproduction Service, P.O. Box 190, Arlington, Virginia 22210:

A Guide to Free and Inexpensive Consumer Education Resources
ERIC # ED 130 949

Lists 45 teaching units in 20 subject categories, from money management and consumer protection to food and health.

Curriculum Materials in Consumer Education, Volumes I-IV
ERIC # ED 129 577

Particularly useful in utilizing case studies to illustrate consumerism.

3. The Institute for Educational Services, Inc. publishes the following:

Consumer Education
MG 000 204
Institute for Educational Services, Inc.
The Merrimack Education Center
101 Mill Road
Chelmsford, Massachusetts 01824

(A model of an interdisciplinary K-12 curriculum approach to consumer education processes.)

4. Joint Council in Economics Education
Lincoln Filene Center
Tufts University
Medford, Massachusetts 02155

IV

SCHOOL CLIMATE

COMMENTARY

When you visit a school for the first time, you are likely to form your own opinions about that school, and how it operates. You may feel that the school is orderly and quiet, and that students and teachers show a serious interest in learning. Or, you may feel that the school is disorderly and noisy, and that no one shows much interest in learning. In stating these opinions, you would be judging the "climate" of the school; you would be saying how you feel about the school, and how it operates.

In 1976-77 students, teachers, administrators, and support staff in twenty-four randomly selected Massachusetts high schools were asked to rate the climate of their schools. The questionnaires developed for the study asked them to rate thirteen characteristics of their schools, such as the sense of community, the amount of challenge to students, and the degree of order in the school. These characteristics are important in themselves, and they are related to student learning.

FINDINGS

School Climate - Kind of Community

The results show that high schools are unique: their differences in climate are greater than their similarities. Some city, suburban, and rural schools are rated high for example, where others are rated average or low. Some schools are rated disorderly and noisy, where others are rated orderly and serious. Some schools are seen as challenging, where others are seen as easy or monotonous. In some schools learning is most important, where in others rote memory for course grades is held more important than what is learned.

School Climate - Size/Organization

Smaller schools are rated better than larger schools regarding friendship and mutual support among school members, and the extent to which students are challenged. Schools with rotating weekly schedules are perceived as better organized, more purposeful, and allow for more student expression and influence. Schools with open campuses, however, are seen as less capable of dealing with problems as they arise.

CURRICULUM OBSERVATIONS

During 1977-78 teams of students, teachers, and administrators in six volunteer schools were assisted in studying the climate of their schools. They gave the climate questionnaires developed in the 1976-77 study to members of their schools, and analyzed and interpreted the results. Based on their findings they made recommendations for the improvement of the climate of their schools:

1. In one school the teachers rated the challenge presented to students very low. They felt that course work was too easy, and that most students were given a "B" grade for work that several years ago would have received a "C". They felt that the school had insufficient graduation requirements, which encouraged students to take a minimum number of courses, and "easy" courses. Their recommendation was to increase graduation requirements, give more credit for "hard" courses, distribute course grades more according to merit, and upgrade the program of career exploration.

2. In another school the students rated the teachers low on availability for extra help, where the teachers rated themselves high on this factor. The problem was attributed to the bus schedule in this town in which most students rode

the bus. Almost all students took the early bus which left ten minutes after the last class. Students did not take the late bus as it involved an hour-and-a-half wait. Thus, students would scramble to see teachers within the ten minutes before the early bus, and only a few could be seen within that time. The students who were continually frustrated rated the teachers low on availability, when in actuality teachers were willing to work with students after school if they would stay. The solution was to move the late bus schedule up so that more students would stay after school for extra help.

Next year these six schools will be making the improvements recommended in their study of school climate. Other schools will be encouraged to visit these schools, and to undertake a study of their own school climate. The questionnaires and procedures developed in these two years are available to schools for this purpose on a continuing basis.

V

MATHEMATICS

COMMENTARY

To a large extent, instructional materials, especially in the earliest grades, are increasingly discarding many of the characteristics of the "new math" that came on like a steamroller in the 1960s. The heavy, pretentious terminology is either changing or completely discarded, along with the hybrid texts that evidently tried to capitalize on both markets, the modern and traditional. The technical jargon of the pure mathematician seems to be on the way out; traditional mathematics, using plain English, appears to be on the way in. Instead of trying to learn about open sets and closed sets and to define the difference between closed and open curves and closed and open regions, texts of many major publishers now present mathematics in its traditional form.

FINDINGS

Mathematics - Basic Skills

Ordinary computational skills are necessary to survive, to handle everyday-life problems; they are also necessary to handle physics, biology and chemistry as well as other academic subjects. Some examples taken from the assessment:

- Seventeen percent of the nine year olds could not add correctly 38 plus 19. And only 26 percent could multiply 9 times 38
- Only 54 percent of the nine year olds were able to recognize parallel lines
- Nineteen percent of the nine year olds could not correctly multiply 3 times 0

Mathematics - Applied Skills

The assessment also revealed a distressing inability of students in both age groups to apply mathematics to everyday situations. Some examples taken from the assessment:

- Only 57 percent of the seventeen year olds answered the following question correctly:

  "A gallon of paint will cover about 250 square feet of surface area. This paint is sold in gallon cans only. How many gallon cans are needed to paint a driveway 48 feet long and ten feet wide?"

- Only 48 percent of the seventeen year olds could answer this "real life" problem correctly:

  "A parking lot charges 35 cents for the first hour and 25 cents for each additional hour or fraction of an hour. For a car parked from 10:45 in the morning until 3:05 in the afternoon, how much money should be charged?"

- Seventeen year olds should know the number of ounces in a pound; be able to convert pounds to ounces; know that the price divided by ounces equals the unit price. Yet only 30 percent answered the following question correctly;

  A housewife will pay the lowest price per ounce for rice if she buys it at the store which offers:

  12 ounces for 40 cents

  14 ounces for 45 cents

  1 pound, 12 ounces for 85 cents

  2 pounds for 99 cents

  (This is a perhaps minor example of the pervasive extent of sex-role stereotyping, since it reveals the attitude that women--housewives--do all the shopping.)

Mathematics - Sex Differences

At age nine, girls did better than boys in mathematics--a great deal better, in fact. Girls performed better on 75 percent of the items.

But sex role stereotyping pervades their later experiences in mathematics, as it does in science. With the exception of arithmetic computation, seventeen year old girls performed poorer than boys. The effect of sex-role stereotyping by society begins in the upper elementary grades to limit or lower girls' career expectations for careers requiring strong mathematical or scientific backgrounds.

Mathematics Skills - Student Employment

Seventeen year olds who work after school in part-time paying jobs generally perform better on the mathematics assessment than students who do not work.

Mathematics - National Comparisons

Massachusetts nine year olds scored as well or better than the national sample on 75 percent of the identical questions. Seventeen year olds scored as well or better on 77 percent of the identical questions.

Mathematics - Educational Programs

Predictably, there is generally a large difference in performance between seventeen year olds in college bound programs and students in general and vocational education programs. The variable with the greatest influence on above average performance is whether the student plans to go to college. The variable most closely associated with below average performance is enrollment in a general education program.

One area in which the difference is not so large is in estimation and measurement. However, in functions, the college bound students out-performed students in general and vocational program by close to forty points. It is assumed that generally only students in college bound programs receive the exposure necessary to answer these kinds of questions.

Mathematics - Consumer Skills

Seventeen year olds are extremely weak in business and consumer mathematics which deals with practical problems, including day-to-day purchasing and household management and involves such skills as calculating commissions, discounts and interest on loans; figuring out tax assessments; and comparative grocery shopping. In fact, the median performance score for this content domain was 43 percent compared to the median performance score of all domains which was 62 percent. Girls performed less well than boys on all five questions concerning business and consumer mathematics. College bound students performed better than other students on every question. (Nine year olds were not included in business and consumer mathematics.)

CURRICULUM OBSERVATIONS

Despite the increasing public and educational focus on returning to the "basics," a review of instructional options in mathematics, strongly indicates that the "basics" are covered thoroughly in many excellent programs. Possibly in better ways than they were forty or fifty years ago. In addition, there are probably more varied offerings now--programs designed to respond to high ability, middle range, and average or below average students--than ever existed. Therefore, returning to the basics in mathematics does not mean that

different materials are needed (they are readily available), but rather that they be used. In the better programs, there is a rich mixture of formalism and application; and even some of the components of modern mathematics are presented with clarity.

Some of the better mathematics programs and texts help to solve or diminish problems in other school subjects, such as social studies, science and consumer education. In concrete ways, some of the programs listed here directly address these complementary concerns.

The instructional materials noted here can help to redress some of the more obvious and disturbing trends revealed in the assessment. These mathematics materials:

- stress basic computational skills;
- apply mathematics to everyday problems and situations, in and out of school;
- respond to varying needs, including those of the slow learner;
- stress drill along with understanding;
- avoid sex-role stereotyping in written examples and illustrations;
- represent third and fourth text revisions, based on wide use in schools throughout the United States and Great Britain.

CURRICULUM MATERIALS

K-8

Mathematics
Houghton Mifflin Company

Mathematics Around Us
Scott, Foresman and Company

MacMillan Mathematics Series M
MacMillan Publishing Company

Laidlaw Mathematics
Laidlaw Brothers

Nuffield Mathematics
John Wiley & Sons, Inc.

Project Mathematics
Winston Press

Holt School Mathematics
Holt, Rinehart and Winston

Mathematics for Mastery
Silver Burdett Company

Growth in Mathematics
Harcourt Brace Jovanovich

Investigating School Mathematics
Addison Wesley

Real Math
Open Court

New Ways in Numbers
D.C. Heath

Other suggested materials, including games, physical objects, and enrichment units are available from these publishers:

Selective Educational Equipment, Inc.

Cuisenaire Company of America, Inc.

Creative Publications

Junior High

Mathematics
Houghton Mifflin Company

Holt School Mathematics
Holt Rinehart and Winston

Mathematics
Scott, Foresman and Company

Mathematics
Silver Burdett Company

Nuffield Mathematics
John Wiley & Sons, Inc.

Intermediate Algebra
W.W. Norton Company

Mathematics
Addison Wesley

Mathematics
Educator's Publishing Service

High School

Mathematics
Holt, Rinehart and Winston

Mathematics
Houghton Mifflin Company

Mathematics
W.H. Freeman and Company

Mathematics
The Independent School Press

Mathematics
Science Research Associates

Note: Edith H. Luchins, professor of mathematics at Rensselaer Polytechnic Institute, Troy, N.Y. 12181, has completed a study on women and mathematics, sponsored by the National Science Foundation. Ms. Luchins is a source of information on activities to help eradicate or lessen the effects of sex-role

stereotyping, from elementary school through university. Other sources are:

Mathematics for Girls Project
Lawrence Hall of Science
University of California at Berkeley

The Boundless Resource
Willard Wirtz
The New Republic Book Company

The Psychology of Sex Differences
Eleanor Maccaby and Carol Jacklin
Stanford University Press

VI

READING

COMMENTARY

Learning to read is a process which is complex and subtle. Over the years methods have changed. The alphabetic method was followed by the phonic method which was followed by a form of structural linguistics. During recent years there has been a great deal of research and more public concern about reading than about anything else that happens in school. The subject of reading is the cause of great debate reflected in the title of Jeanne Chall's book, Learning to Read, The Great Debate. The findings of the Massachusetts assessment will not resolve the debate. But, some of the findings provide critical insights into why some schools are more successful than others at teaching reading.

At all levels the ability to read is more than being able to recognize words. It is also the capacity to respond imaginatively and with feeling to the experiences books can give. The essence of teaching reading, therefore, is to create the need and the desire to read; attention must be paid to this at all educational levels.

FINDINGS

Reading - Principals' Attitudes

The school principals do make a difference. In fact, they can be the difference between an achieving school and a failing school. A clear, definite and consistent course of action by the principal can make the

significant difference.*

The assessment revealed that when a principal noted his or her determination to stress reading in the school -- stressed by the school as a whole, in preference to other choices -- the students in that school show better performance. This is the case for both elementary and high schools; it is especially so for high schools. When the reading objective is rated by the principal as "central", there is often a large difference (thirteen points and more) in student performance from schools in which the reading objective is not stressed, but rather is rated "peripheral".

Reading - Sex Difference

Sex makes more of a difference in the younger group, where girls show more reading proficiency on 20 of the 22 items, than in the older group where they score better than the boys on 25 out of 36 items. This kind of difference is a finding common to the research on sex differences in reading. The gap between the sexes decreases with age.

Reading - Background

Seventeen year olds who plan to matriculate in four-year colleges and universities and whose parents attended college exceed the performance of students who have different educational expectations and whose parents did not attend college.

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* One of the more noteworthy and sensitive confirmations of the principal's role is a research project, started in 1973 and supported by the Carnegie Corporation of New York, under the direction of Ronald Edmonds of Harvard's Graduate School of Education. His study confirms that an effective principal can be one on the major factors in reading performance. The title of the project is "Search for Effective Schools: The Identification and Analysis of City Schools That Are Instructionally Effective for Poor Children."

Reading Skills - Kind of Community

Students in both age groups who live in residential suburbs perform better in reading than students who live in urban areas, small towns, or industrial suburbs.

Reading - National Comparisons

Massachusetts nine year olds exceed the performance of their peers nationally. Though the seventeen year olds perform above average, they do not achieve as well as the nine year olds in comparison with national samples.

CURRICULUM OBSERVATIONS

Many causes of the alleged decline in reading have been suggested; and some observers will quickly state that a solution lies in returning to the "basics." But the Massachusetts assessment reveals that nine year olds are doing well, and a review of instructional materials indicates that the basics seem to be covered well. The problem areas occur possibly in abundance after the fourth grade.

Recently, there is a greater emphasis on the teaching of reading in the upper elementary grades as evidenced by increased purchases of basal reading materials. In fact, in the immediate future, there should be a demonstrated improvement in the reading skills of young adults resulting from the use of these materials.

In the high school, students who read poorly do need special assistance. For these students to be able to catch up, "second chance" reading instruction is a necessity; several major publishers now have programs available to help do this. The better programs help to correct or repair some of the reading skills deficits by making a concerted effort to

teach interpretive and evaluative comprehension skills, not just skills of literal comprehension.

Materials are available that directly address some of the problem areas revealed by the assessment. Since there is no single best way of teaching children to read, care should be taken in selecting materials.

CURRICULUM MATERIALS

K-8

Holt Basic Reading System
Holt Rinehart and Winston

Ginn Reading Series
Ginn and Company

Open Court Basic Readers
Open Court Publishing Company

Houghton Mifflin Reading Series
Houghton Mifflin Company

The following supplementary materials are available:

Books and Pamphlets
Addison Wesley

Specific Skills Series
Barnwell Left Inc.

Supplementary Materials
Teaching Resources, Inc.

Multiple Skill Series
Levell and Lynwood Ltd.

Discovering Phonics We Use
Rand McNally

Ladybird Key Words Reading Scheme
Merry Thoughts

Books for classrooms and libraries are available from these publishers:

Four Winds Press

Doubleday & Company

General Books for Young Readers
Harcourt Brace

Viking Junior Books

G.P. Putnam's Sons

Books for Children
Collins-World

Fiction for Feminists
(Ages 8-12 and up)
The Seabury Press

Books for Young Readers
Alfred A. Knopf, Inc.

Books for Children and Young People
Lothrop, Lee & Shepart Company

Harvey House books for Children

Atheneum Books for Children

Books for Young People
S.G. Phillips

Farrar, Straus and Giroux

Books for Boys and Girls

Houghton Mifflin Company

Note: Inside the Primary School, by John Blackie, published by Her Majesty's Stationery Office, London, is an excellent book for teachers of young children. Also: Equipment and Supplies, Association for Childhood International, Washington, D.C., How Children Fail and The Underachieving School, by John Holt (paperback, in many book shops), and Intellectual Growth in Young Children, by Susan Isaacs, Routledge & Kegan Paul, 68-74 Carter Lane, London E.C. 4, England. Varied reports and suggestions are also available from the Right-to-Read Office, Room 2131, 400 Maryland Avenue, SW, Washington, D.C. 20202. The ERIC Clearinghouse on Reading and Communications Skills, Urbana, Illinois, published this report: "Effective Reading Programs; Summaries of 222 Selected Programs." (LB1050.u56/1975)

Junior and Senior High School

"Catch-up" reading programs are available from these publishers:

Ginn and Company
Silber Burdett
Prentice-Hall
Holt Rinehart and Winston
Science Research Associates
Macmillan

VII

SOCIAL STUDIES

COMMENTARY

Both the national and Massachusetts assessments reveal large deficits in knowledge and understanding about American history and government at all levels -- national, state and local. The Massachusetts assessment suggests that large numbers of seventeen year olds neither care about nor hope to improve or change the system -- whatever it is. Everyone should be greatly concerned that only 63 percent of the seventeen year olds know that the organization of industry is based on government ownership and control in Russia and not in the United States; and that 61 percent of the nine year olds believe that the police can come into your house at any time.

FINDINGS

Social Studies - Attitudes

Skepticism, if not cynicism, is an indication of critical thinking. Not surprisingly, seventeen year olds who consider themselves skeptical performed better overall in this part of the assessment. These are some of the findings about seventeen year olds' attitudes about government and politics:

- Forty-four percent feel that the government in Washington can be "trusted some of the time".
- Sixty-nine percent feel that "quite a few" leaders are a "little bit crooked".
- Forty-five percent feel that government is run for the "benefit of a few big interests" and 50 percent feel that government is run for the "benefit of the people".

Social Studies - Sex Differences

The consistently poor performance of girls in both age groups is alarming. On some questions for the older group, the performance of girls was 30 percent below that of boys. Even in elementary school, girls performed poorer than boys.

High school girls showed less knowledge than boys in history, economics,and geography, and in such basic technical skills as reading latitude and longitude on a map.

Why girls consistently performed poorer is a puzzle and a paradox. Valuable insights into the differences in achievement between males and females can be gained by reading The Psychology of Sex Differences by Maccoby and Jacklin, Stanford University Press, 1974.

Social Studies - National Comparisons

In comparison with the national sample, the nine year olds scored as well or better on 68 percent of the same items. The seventeen year olds scored as well or better on 60 percent of the items. Massachusetts students in both age groups performed poorer in comparison to the Northeast sample.

Social Studies - Problem Areas

There are some surprising gaps in the knowledge of both nine and seventeen year olds. Twenty-five percent of nine year olds think that a city's health department spends its time putting out fires. One out of three nine year olds reports that the Mississippi River is not in the United States and a like proportion reports that Africa is north of Europe. A third of them do not know the occupations of their parents. Fifty six percent of seventeen year olds do not know what a monopoly is and 35 percent do not know a reason why the American colonies rebelled against Great Britain.

CURRICULUM OBSERVATIONS

Instructional materials exist and are easily available to attack directly some of the problems indicated by the assessment. Although there are no complete, new curricula in social studies, as there are in mathematics and the sciences, there are materials to help achieve these objectives and accommodate some of these concerns. Social studies materials ought to:

- Provide an incisive and rigorous understanding of some aspects of American and world history.
- Lessen the effects of sex-role stereotyping with proper mixtures of illustrations, examples in the text, and analogies.
- Encourage students to develop critical thinking, challenge assumptions, make inferences cautiously on the basis of some evidence; and separate fact from opinion.
- Present government and economics in a rigorous fashion at the high school level.

Some excellent enrichment materials are available such as newspaper-in-the-classroom programs, pamphlets on the federal government and films about other cultures. In addition some textbook series, at each school level, cover many of the social studies topics which seemed to present trouble on the assessment. It is interesting to note that what was generally considered innovative material a few years ago now is soundly incorporated in some of the curricula.

CURRICULUM MATERIALS

K - 8

People: Cultures, Times, Places
Addison Wesley

Social Studies Data Bank
Holt Rinehart and Winston

Social Studies
Houghton Mifflin

Social Studies
Noble and Noble

Educational Games
Abt Publications

Smithsonian Slide Sets
Photographic Services

Social Sciences: Concepts and Values
Harcourt Brace Jovanovich

Multi-Cultural Materials
Inter Culture Associates

Family of Man and Matchbox Series
Selective Educational Equipment

Urban Communities (upper elementary)
Charles E. Merrill

Newspaper-in-the-Classroom
The Boston Globe

School Division
The New York Times

Scholastic Readers

Smithsonian Institution

Social Sciences
Silver Burdett

Textbook by Wire (upper elementary)
Associated Press

Varied Materials (pamphlets, books, maps)
J. Weston Walch

Man: A Course of Study (upper elementary)
Curriculum Development Associates

Junior High School

From Subject to Citizen
Denoyer-Geppert

America Is and In Search of Justice
Charles E. Merrill

Jackdaws
Rancourt and Company

History and Government Series
Benziger

Social Studies
Follett Publishing Company

Spoken Arts Multi-media
Rancourt and Company

Documentary Photo Aids
Documentary Photo Aids

Public Issues Series
American Education Publications

The American Experience
Scholastic and Smithsonian Institution

Newspaper-in-the-Classroom Programs
The Boston Globe and the New York Times

Multi-Cultural Materials
Interculture Associates

Textbook by Wire
Associated Press

Social Studies
Holt Rinehart and Winston

Social Studies
Houghton Mifflin Company

Time-Life-Books & This is Our World
Silver Burdett

Story of Our Country
Allyn and Bacon

Social Studies
Addison Wesley

Social Sciences
Heinemann Education Books Ltd

Two Centuries of Progress
Laidlaw Brothers

High School

Social Studies
McDougal, Littell & Company

This Is America's Story and Series
Houghton Mifflin Company

Social Studies
Holt Rinehart Winston

A Global History of Man
Allyn and Bacon

World Cultures & The American Dream
Scott Foresman

Social Studies
Scott Foresman

Varied Materials (books and pamphlets)
Benziger

Holocaust Materials
Brookline School System and ADL

Public Issues Series
American Education Publications

Social Studies Texts
The Independent School Press

History of A Free People and New Perspectives in American History
Macmillan

Government and Politics
Congressional Quarterly

The New York Times School Weekly

Newspaper-in-the-Classroom Programs
The Boston Globe, The Christian Science Monitor and The New York Times

Social Studies
Allyn and Bacon

Varied Maps
Rand McNally

Education Games
Abt Publications

Social Studies
Science Research Associates

Social Studies
Harcourt Brace Jovanovich

Varied Materials (pamphlets, books, maps)
J. Weston Walsh

Problems in American Civilization and The Great Republic and America: A Modern History of the United States
D. C. Heath

The Lincoln Filene Center at Tufts University offers short-term courses in economics and other social sciences for teachers.

Note: Many trade publishers distribute school catalogs, including Bantam Books, Inc., 666 Fifth Avenue, New York, N. Y. 10019 and ERIC Clearinghouse for Social Studies/Social Science Education, 855 Broadway, Boulder, Colorado 80302 which are useful resources. An excellent resource book for teachers is Teaching Public Issues in the High School, by Oliver and Shaver, published by Houghton Mifflin Company. Excellent documentary photographs and editorial cartoons are published by Documentary Photo Aids, P.O. Box 956, Mount Doro, Florida 32757.

VIII

WRITING

COMMENTARY

This part of the assessment dealt mainly with examples of basic writing skills such as taking telephone messages, addressing envelopes and completing application forms. In addition nine and seventeen year olds were required to write an essay on an assigned task.

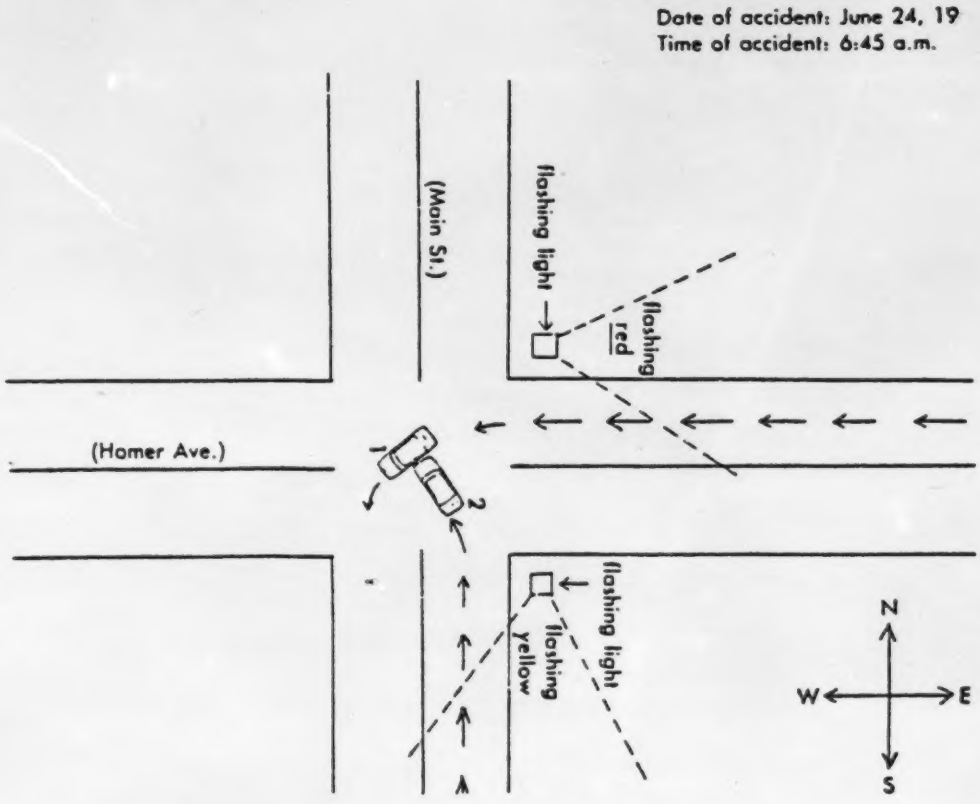
Writing well is not a survival skill; it is a talent that is learned over a period of years by writing, by reading models of clear thinking and good writing, and by having sensitive and perceptive teachers and critics. To learn how to write well is a life-long process, not just a superficial skill that can be taught in a few years. There is an erroneous impression that the required language skills can all be taught in the elementary grades. There was a time, of course, when elementary schools were called grammar schools; but there is no reason to assume that because grammar may have been stressed more in the past, younger students were able to communicate in writing any better than they are today. Apparently, continuing programs are needed to teach all students -- from elementary school through college -- how to write.

FINDINGS

Writing - Sex Differences

At both age levels, girls performed better than boys. Among the nine year olds, girls show more proficiency at reading on 20 out of 22 questions; and seventeen year old girls performed better than boys on 25 of the 36 questions. And the same differences exist in their demonstration of writing proficiency. Seventeen year old girls, for example, are better at

following directions, taking messages, and reading instructions. An interesting example in which the high school girls out-perform boys is their performance in writing a description of the following accident diagram:



Only 33 percent of the seventeen year olds -- boys and girls -- gave acceptable answers for the accident report; nationally, 54 percent gave acceptable answers.

Writing - National Comparisons

Nine year olds appear to do well in writing. Based on both the national and Massachusetts assessments, the data suggest that nine year olds in the Commonwealth write above the national average. They do better than, or

as well as, their national counterparts in communicating in social or business situations. The only instance in the assessment in which they performed less well than their national counterparts was in writing an essay. Seventeen year olds can neither communicate in social or business situations, nor write essays as well as their national counterparts. Twenty-six percent cannot spell "Massachusetts" correctly. Additionally, seventeen year olds misspelled an average of slightly over two words out of every hundred and made an error in punctuation in roughly the same proportion. Predictably, seventeen year olds in college bound programs performed better than their peers in general and vocational programs.

CURRICULUM OBSERVATIONS

The key to writing is not the sentence itself but rather the thought behind the sentence. Students must sharpen their critical skills before they can be good writers. Language, literature, and composition build the foundation and unless students read, discuss, and write about literature and history of the highest order, it is unlikely they will appreciate good writing, let alone recognize it. There is no major program that alone creates good writers. But it really should not be so difficult to teach students to write effectively, simply and clearly. Instructional materials of all kinds--from grammars to composition books and novels and plays--are easily available to help improve writing.

Elementary schools generally do a better job of teaching writing than junior and senior high schools, perhaps because there may be a premium on imaginative writing, or writing with feeling in the elementary grades. This kind of writing seems to decrease as a student progresses in school.

CURRICULUM MATERIALS

K - 8

Many of the programs and materials listed in the section on reading are also appropriate for improving writing abilities. These language arts programs are suggested:

Communications Skills Program
Ginn

Language Arts Series
Houghton Mifflin Company

Language Arts Series
Holt Rinehart and Winston

Language Arts
Prentice Hall

Language Arts
Addison Wesley

Language Arts
Harcourt Brace Jovanovich

Language Arts
Charles E. Merrill

Basic Verbal Skills Series
The Independent School Press

Some schools may want to develop their own writing programs, mainly by selecting books from a number of different publishers, including:

Little Brown

The Macmillan Co.

Citation Press
Scholastic Book Services

Dell Publishing Company

Random House

High School

The same publishers listed before, and many more trade publishers, also publish composition and language arts programs for the high school grades. Teachers will want to select their own programs and books; the choice is extremely wide and many less-expensive paperback books are available.

Some excellent books and grammars are: The Elements of Style, by Strunk and White, Writing Well, by Donald Hall and Harbrace Handbook of English. Hooked on Books, by Fader and McNeill, is also a useful resource for teachers.

IX

SCIENCE AND ECOLOGY

COMMENTARY

The expansion of knowledge in the natural and physical sciences in recent decades is reflected in many science courses in the high school, and rigorous, experimentally-oriented science programs are available at all grade levels. Excellent options are available. Many programs come with a host of learning aids: films, laboratory apparatus and experiments, and texts. Collateral reading and examinations are all complementary and integral parts of the whole. Each medium of instruction is being used to its best advantage to reinforce, not duplicate, the effectiveness of the others. The National Science Foundation has allocated more than $300 million since 1956 to develop laboratory-oriented science courses at all grade levels; roughly $400 million more has been devoted to teacher training institutes.

FINDINGS

Enrollment in Laboratory Courses

Almost 32 percent of the seventeen year olds report that they never had a laboratory-oriented science course; and the performance of these students on the assessment is lower than that of students who have studied in laboratory-oriented programs.

Science and Ecology - Parental Involvement

The higher-performing students in the high school group report that they talked with their parents "fairly regularly" about science. Poorer-performing students do not have this linkage with their parents. The assessment suggests the more parent involvement the better.

Science and Ecology - Sex Differences

As in the national assessment, high school girls in the Massachusetts assessment performed poorer than boys in all science subjects, including biology and ecology. The effects of sex-role stereotyping are as debilitating as they are alarming.

The differences among the nine year olds are imperceptible. A 1974 study of science in Massachusetts elementary schools* reported that only 14 percent of a sample of fifth and sixth grade students felt that society wanted girls to become scientists. Children's attitudes about science as well as the assumption that girls cannot do experimental work appear to be generated during the elementary years, therefore aggravating the poor performance of girls in later years.

Science and Ecology - Supervision

Seventy-four percent of the elementary schools in the sample, report they have neither a science supervisor nor a science coordinator assigned to them. The 1974 study** reported that the likelihood of a school using National Science Foundation supported programs was related to the presence of a science coordinator in the system.

Science and Ecology - Background

Science performance in both age groups is related to family occupation and economic background. Students in residential suburbs performed better than students who live in other kinds of communities.

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* Essentially Elementary Science, Dean K. Whitla and Dan C. Pinck, Harvard University, 1974

** Ibid.

Science and Ecology - National Comparisons

Nine year olds do extremely well compared to their national counterparts. Seventeen year olds scored at a level identical to their national counterparts. Most Massachusetts nine year olds know that the earth moves once a year around the sun. However, few nine year olds know that the sun provides the energy that plants need to make food. Most Massachusetts seventeen year olds can identify the function of electrons in forming chemical bonds. However, few seventeen year olds know that sound travels faster in cold air than in hot air.

CURRICULUM OBSERVATIONS

The better science programs make progress possible and help to bring about a greater understanding of science. The extensive course content improvement work spearheaded by the National Science Foundation has affected the science programs of the majority of publishers.

The better programs have some of these attributes:

- an experimental approach, with hands-on laboratory experiences as an integral part of the teaching and learning process
- a vision of science as something to "do" not just something to "read" about; the better programs encourage independent learning
- experimental activities which encourage individual experimentation and which can help to change girls' attitudes toward science by dispelling the belief that an interest in science and the ability to perform science experiments are sex-linked functions
- teaching guides of superior quality
- both a sound understanding of science as a process of inquiry and the experiences necessary to apply concepts and knowledge

- a recognition, at the elementary level, of science as a total discipline, not a number of separate disciplines
- provision for a rich mixture of science programs as well as supplemental materials for slow and fast learners at the secondary level

CURRICULUM MATERIALS

K - 8

Elementary Science Study (ESS)
McGraw-Hill Book Co.

Elementary Science Study (ESS)
American Science and Engineering

Science Curriculum Improvement Study (SCIS)
Rand McNally and Co.

Science Curriculum Improvement Study (SCIS)
American Science and Engineering

Science A Process Approach
Xerox

Modular Activities Program in Science
Houghton Mifflin

Concepts in Science
Harcourt Brace Jovanovich

Earth and Space Science
Learning Technology, Inc.

Elementary Science Study (ESS)
Addison-Wesley

Unit Box Approach
Professor Mitchell M. Batoff

Science 5/13
Purnell Educational

Note: All science teachers in all grades should be fully aware of science safety. An excellent handbook was compiled by Martin W. Pankratz, Director of Science for the public schools of Medford, and by the members of the Massachusetts Association of Science Supervisors. This handbook is available for Massachusetts schools. In a recent paper, Ruth T. Wellman of Marshall University, in Huntington, West Virginia reported on science as a basic language for reading development. Her survey reviews research indicating that reading proficiency increased in controlled situations when students in elementary schools were studying the Science Curriculum Improvement Study, the Elementary Science Study, or the Science A Process Approach.

Junior High School

Introductory Physical Science (IPS)
Prentice Hall

Physical Science Investigations and Earth Science Curriculum Project (ESCP)
Houghton Mifflin Company

Ideas and Investigations in Science (IIS)
Prentice Hall

Man and the Biosphere
Rand McNally

Intermediate Science Curriculum Study (ISCS)
Silver Burdett

Concepts in Science
Harcourt Brace Jovanovich

Elementary Science Study (ESS)
McGraw Hill and Selective Educational Equipment

Junior High Science
Addison Wesley

High School

Biology

The Biological Sciences Curriculum Study (BSCS) produced four different versions, aimed at varying ability levels. Materials are published by four different publishers. For information, write to: BSCS, P.O. Box 930, Boulder, Colorado 80302. (Houghton Mifflin, in Boston, publishes the Yellow Version of the BSCS.)

Biology
Holt Rinehart and Winston

Biology
D.C. Heath

Biology Today
Random House

Biology
John W. Wiley & Son

Biology
W. H. Freeman

Biology
Worth Publishing Co.

Biology
Allyn and Bacon

Physics

Project Physics
Holt Rinehart Winston

Physical Sciences Study Committee
Prentice Hall

Modern Physics
Holt

Physics
Houghton Mifflin Company

Physical Science Study Committee
D. C. Heath

Physics
Addison Wesley

Physics
Allyn and Bacon

Concepts in Physics
Harcourt Brace Jovanovich

Matter and Energy
Barns and Noble

Chemistry

Self Paced Independent Study Course
Prentice Hall

Experimental Foundations of Chemistry
D. C. Heath

Modern Chemistry
Holt Rinehart and Winston

Foundations of Chemistry
Holt Rinehart and Winston

Chemistry
Harcourt Brace Jovanovich

Chemistry
Silver Burdett

Chemistry: An Experimental Science (CHEM)
D. C. Heath

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ADDITIONAL RESOURCES

Resources and Referral Service RRS Mini-Lists
Research and Exchange
National Institute of Education
Washington, D.C. 20208

Reports from Educational Facilities Laboratories, Inc.
477 Madison Avenue
New York, N.Y. 10022

Instructional Materials: Selection and Purchase
National Education Association
Washington, D.C.

Exchange of Curriculum Materials
Merrimack Education Center
101 Mill Road
Chelmsford, Massachusetts 01824

Trends and Tempos Exchange Bank
IES MEC Information Service
101 Mill Road
Chelmsford, Massachusetts 01824

EPIEgram, The Educational Consumers Newsletter
Educational Products Information Exchange Institute
475 Riverside Drive
New York, N.Y. 10027

Kaleidescope and other publications and services
Bureau of Curriculum Services
Massachusetts Department of Education
31 St. James Avenue
Boston, Massachusetts 02116

Handbook on Collaboratives in Massachusetts; varied projects and programs
Hampshire Educational Collaborative
127 Russell Street
Hadley, Massachusetts 01035

Massachusetts Educational Television
Bureau of Media Services
Massachusetts Department of Education
54 Rindge Avenue Extension
Cambridge, Massachusetts 02140

Massachusetts Film and Media Service Cooperative
Fitchburg State College
Fitchburg, Massachusetts 01420

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ADDRESSES OF PUBLISHERS

Abt Publications
55 Wheeler Street
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Jacob Way
Reading, MA 01167

Allyn and Bacon, Inc.
Rockleigh, N.J. 07647

American Education Publications
55 High Street
Middleton, CT 06457

American Science and Engineering
955 Massachusetts Avenue
Cambridge, MA 02139

Anti-Defamation League
315 Lexington Avenue
New York, N.Y. 10016

Associated Press
260 Summer Street
Boston, MA 02210

Atheneum
122 East 42nd Street
New York, N.Y. 10024

Australian Science Education Project
11 Glenbervie Road
Toorak
Victoria, Australia 3142

Barnell Loft Inc.
958 Church Street
Baldwin, N.Y. 11510

Benziger
8701 Wilshire Boulevard
Beverly Hills, CA 90213

Boston Globe
135 Morrissey Boulevard
Boston, MA 02107

Chatto and Windus Educational Ltd.
42 William IV Street
London, England

Christian Science Monitor
1 Norway Street
Boston, MA 02115

Citation Press
Scholastic Book Services
50 West 44th Street
New York, NY 10036

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1414 22nd Street NW
Washington, D.C.

Creative Publications
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Mountain View, CA 94303

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Washington, D.C. 20036

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New York, NY 10017

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5235 Ravenswood Avenue
Chicago, IL 60640

Documentary Photo Aids
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Mount Dora, FL 32757

Doubleday and Company
School Department
Garden City, L.I., NY 11530

Educational Enrichment Materials
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Portland, ME 14103

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Pinnacles, Harlow, Essex, England

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New York, NY 10017

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Boston, MA 02107

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Wellesley Hills, MA 02181

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Morristown, NJ 07960

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1000 Jefferson Drive, SW
Washington, D.C.

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Teaching Resources, Inc.
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Boston, MA 02116

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New York, NY 10022

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Portland, ME 04104

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New York, NY 10016

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Minneapolis, MI 55403

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444 Park Avenue S.
New York, NY 10016

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